Guidelines for Calculating Emissions from Greenwaste Composting and Co-Composting Operations

December 2020

DESCRIPTION:

Composting refers to the active phase biodegradation and subsequent curing phase of organic waste materials. Greenwaste composting is microbiological decomposition of greenwaste by itself, or in combination with foodwaste, or up to 20 percent manure, per pile volume basis. Co-Composting is composting of biosolids and/or manure with a bulking agent. Composting of greenwaste combined with manure greater than 20 percent, per pile volume basis, is considered as co-composting. Specific to greenwaste composting and co-composting, Rule 301 requires that the total weight of emissions of organic gases (VOC) and ammonia (NH_3) be annually reported, even those which continue to passively emit air contaminants after they are processed by permitted or unpermitted equipment or operations.

1. EMISSION CALCULATION PROCEDURES

a) Facilities can estimate their VOC and NH_3 emissions using equation (1) when the emissions are not being controlled or equation (2) when the emissions are being controlled prior to be released to the atmosphere.

EMISSION = Throughput * Uncontrolled Emission Factor (1)

EMISSION = Throughput * Controlled Emission Factor (2)

Where,

EMISSION: VOC or NH_3 emissions expressed in pounds per year (lb/yr)

Throughput: Mass of foodwaste, manure, biosolids, and greenwaste in tons per year as received by a facility and processed through composting excluding recycled materials.

Uncontrolled Emission Factor (EF_u): SCAQMD default factors that are taken from the Rule 1133.2 and Rule 1133.3 staff reports and are available to estimate the emissions from co-composting and greenwaste composting operations.

Controlled Emission Factors (EF_c): These are the factors determined based on the types of emissions control exist at the facility such as best management practices or additional SCAQMD approved control system as described below.

If controlled emission factors are used to estimate emissions, you must provide the District with documentation that demonstrates compliance.

i. ***Best Management Practices***: The best management practices are defined as when greenwaste composting piles are covered with at least six inches of finished compost within 24 hours of initial pile formation, and not turned for the first seven days of active phase composting, and

For the first fifteen days of initial pile formation, and within six hours before turning, the top half of the pile is kept wet to a depth of at least three inches.

ii. ***Add-on Control***: SCAQMD approved emission control system is used for greenwaste composting and co-composting piles (i.e., Thermal Oxidizer (T/O), Bio-filtration, etc.)

b) **Uncontrolled and Controlled Emission Factors for Greenwaste Composting & Co-Composting Operations**

The uncontrolled emission factors for VOC & NH_3 are provided in Table 1 and the controlled emission factors are listed under Table 2a for housekeeping practices and Table 2b for add-on control.

Table 1: Uncontrolled Emission Factors

Operation	**VOC (lbs/ton of throughput)**	**NH_3 (lbs/ton of throughput)**
Greenwaste Composting	4.67	0.66
Co-Composting	1.78	2.93

Table 2a: Controlled Emission Factors (Best Management Practices)

Operation	**VOC (lbs/ton of throughput)**	**NH_3 (lbs/ton of throughput)**
Greenwaste Composting	2.97*	0.57**

*This value assumes 40% control applied to the active phase only

**This value assumes 20% control applied to the active phase only

Table 2b: Controlled Emission Factors (Add-On Control)

Operation	**VOC (lbs/ton of throughput)**	**NH_3 (lbs/ton of throughput)**
Greenwaste Composting*	$4.25 \times (1\text{-}CE_{A,VOC}) + 0.42 \times (1\text{-}CE_{C,VOC})$	$0.46 \times (1\text{-}CE_{A,NH3}) + 0.20 \times (1\text{-}CE_{C,NH3})$
Co-Composting	$1.78 \times (1\text{-}CE_{VOC})$	$2.93 \times (1\text{-}CE_{NH3})$

*Where, CE_{VOC} or CE_{NH3} is a control efficiency of the Add-on control and expressed as a decimal fraction. *The subscript A for greenwaste composting refers to the control efficiency during the active phase, and the subscript C refers to the control efficiency (if any) during the curing phase.*

c) VOC and NH_3 Emissions Calculations

To estimate the total VOC and NH_3 emissions from greenwaste composting or co-composting operations,

1. Take the total weight of foodwaste, manure, biosolids, and greenwaste in tons per year as received by a facility and processed through composting excluding recycled materials.
2. Take the uncontrolled emission factor from Table 1 when there is no control at the facility or controlled emission factors from Tables 2a or 2b when best management

practices or SCAQMD approved control system are used, based on the type of emissions (i.e., VOC, NH_3).

3. Enter the values obtained in steps 1 and 2 in equations (1) or (2), whichever applicable, to estimate the VOC & NH_3 emissions for greenwaste composting and/or co-composting operations.

d) If a source test was conducted, then emission factors derived from District-approved source test can be used to estimate VOC & NH3 emissions.

2. EXAMPLES:

The following examples show how data are entered into the AER Web Tool and emissions are reported. A facility reports emissions from three distinct greenwaste composting and co-composting operations as follows:

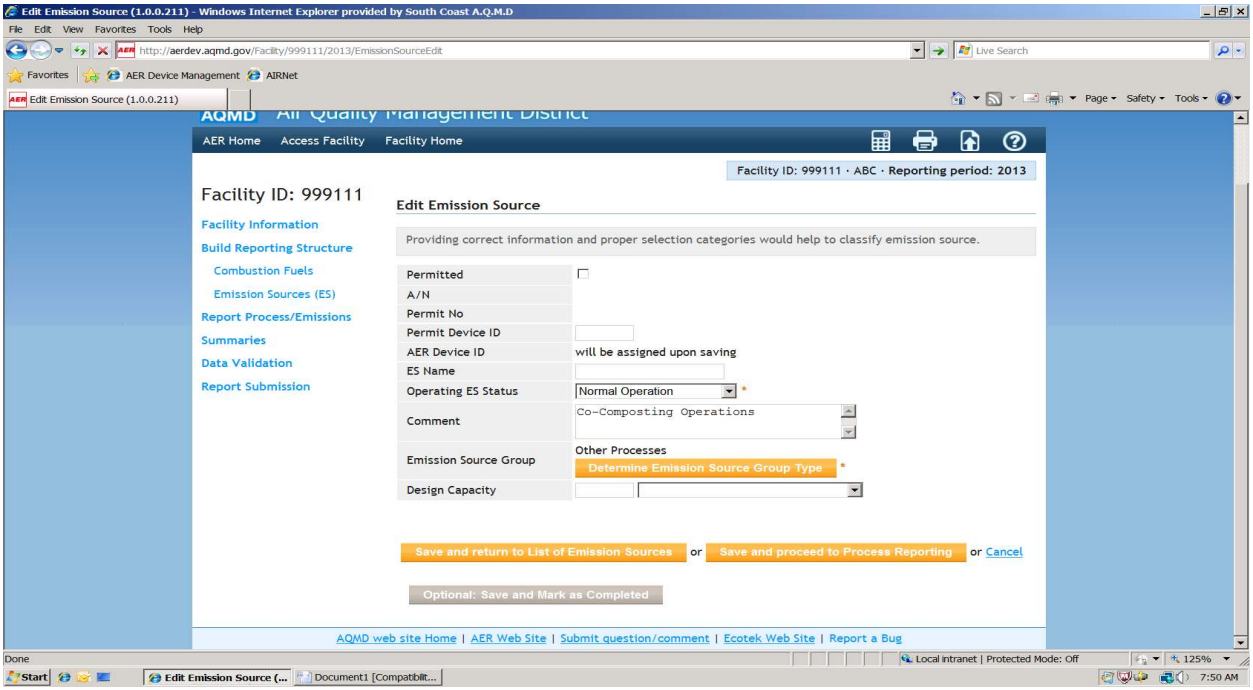
Operation 1: Co-composted 8,000 tons of materials with no add-on control. The VOC and NH_3 emissions are estimated as shown in screenshots 1 - 7 below with emission factors from row 2 of Table 1.

Operation 2: Composted 10,000 tons of combined greenwaste composting materials with good housekeeping practices. The VOC and NH_3 emissions are estimated as shown in screenshots 8 - 13 below with emission factors from Table 2a.

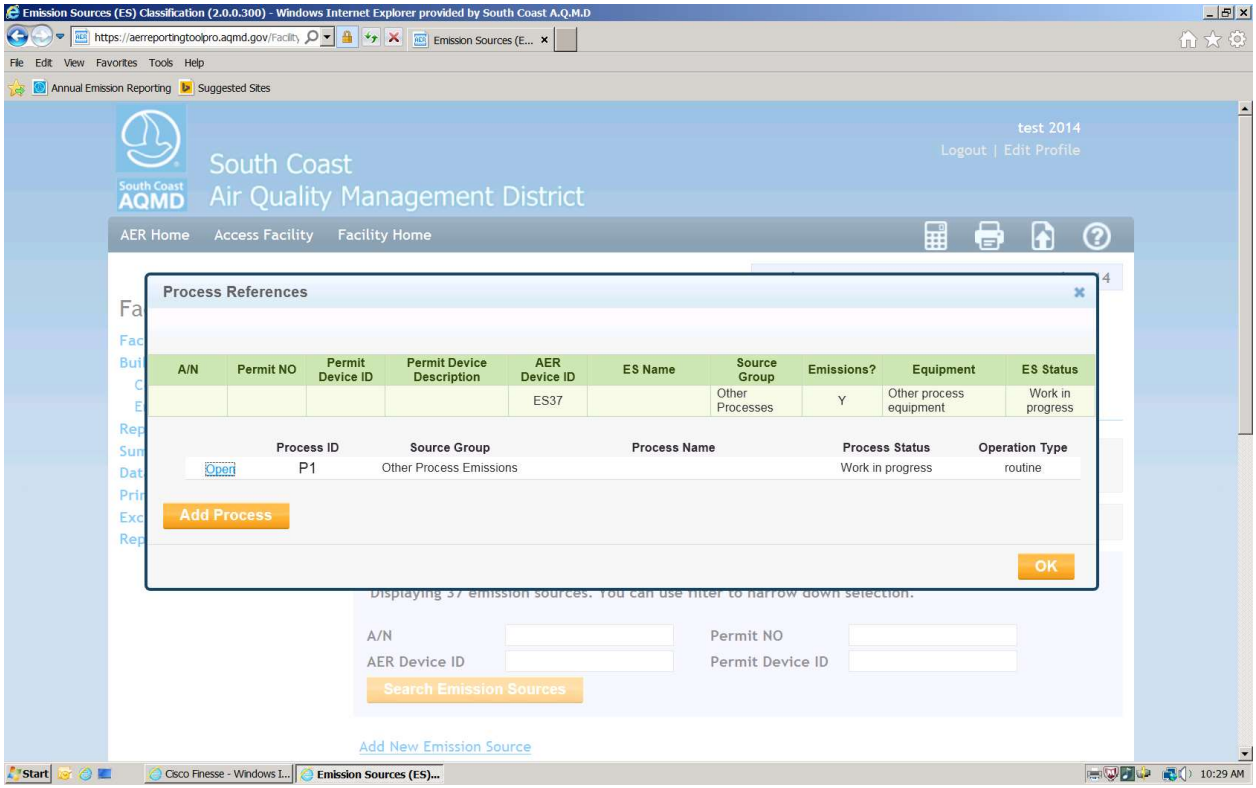
Operation 3: Co-composted 18,000 tons of materials with add-on control system: thermal oxidizer (T/O) controlling VOC at 99.2% efficient and bio-filter controlling NH_3 at 75% efficient. The VOC and NH_3 emissions are estimated as shown in screenshots 14 - 20 below with emission factors from row 2 of Table 2b.

Screenshot #21 shows emissions from composting and co-composting processes are added.

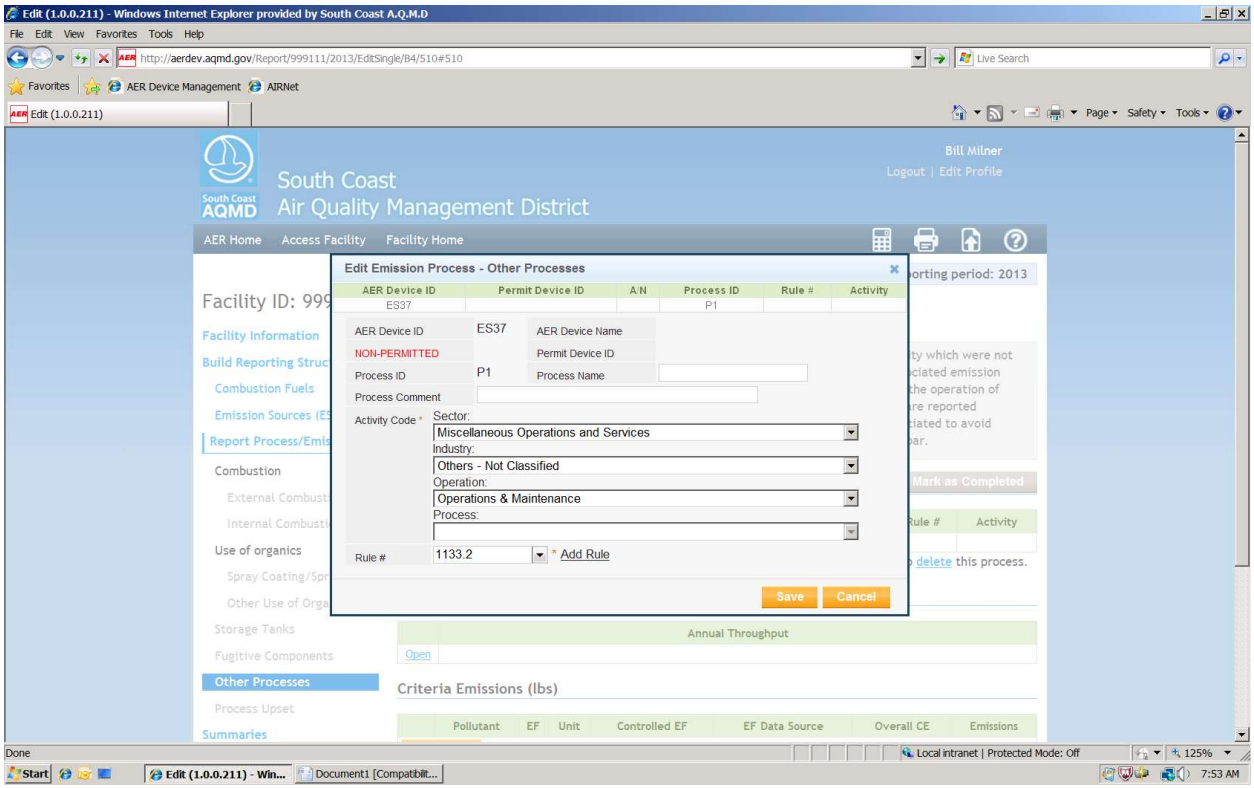
Operation 1: Screenshot #1: Add Emission Source for Uncontrolled Co-Composting Operation



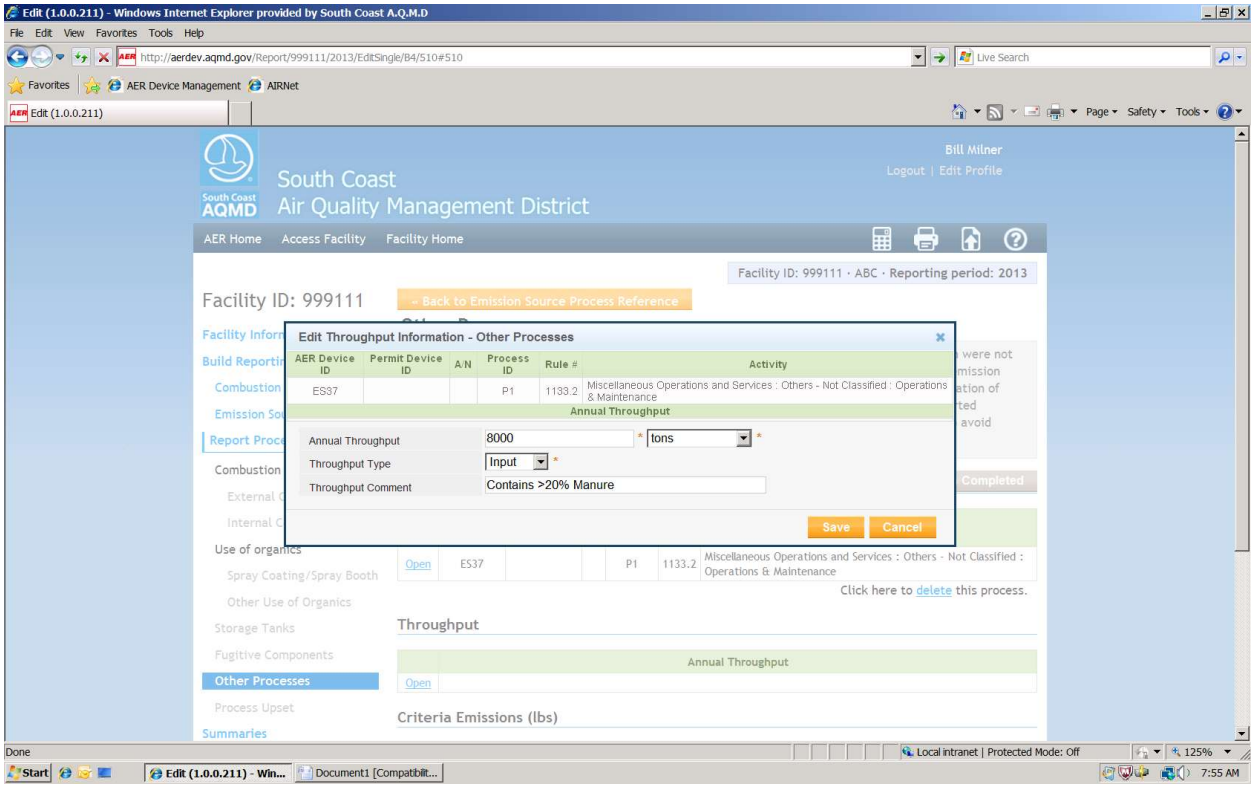
Operation 1: Screenshot #2: Select Process ID P1



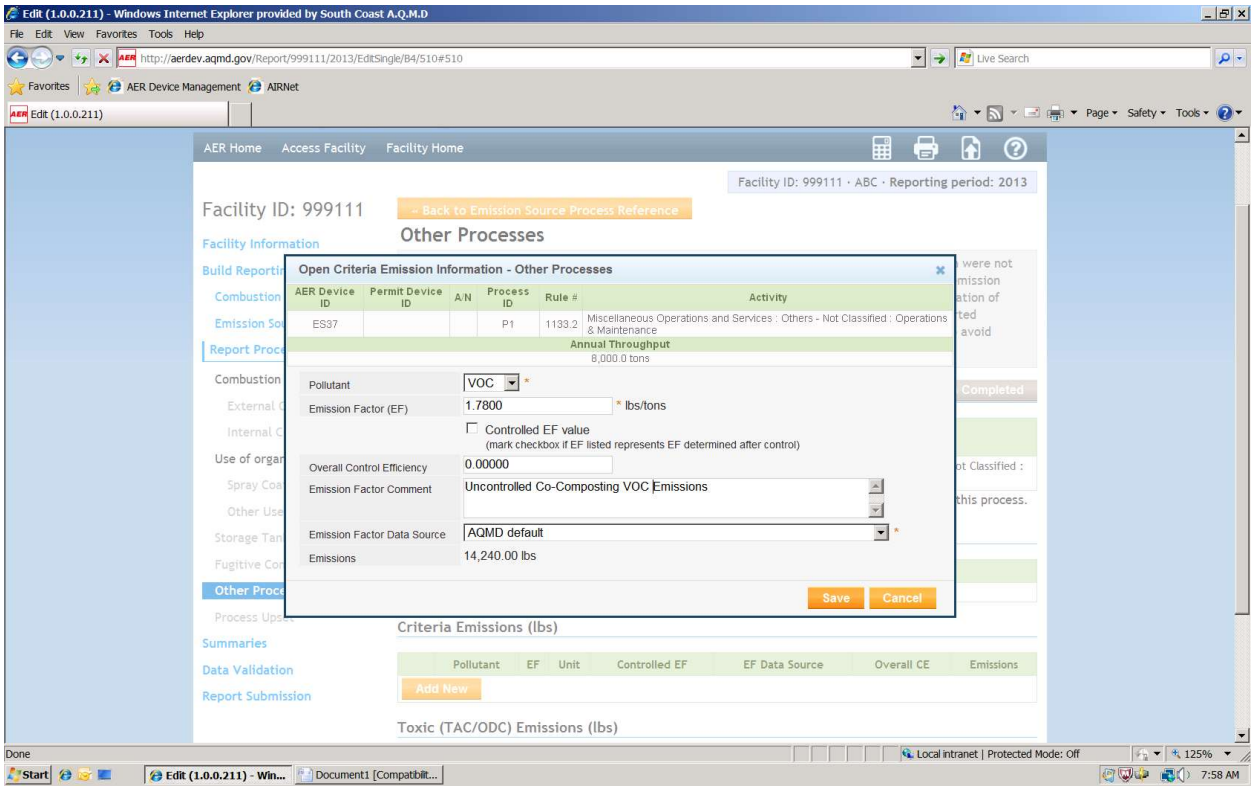
Operation 1: Screenshot #3: Assign Activity Code and Rule Number



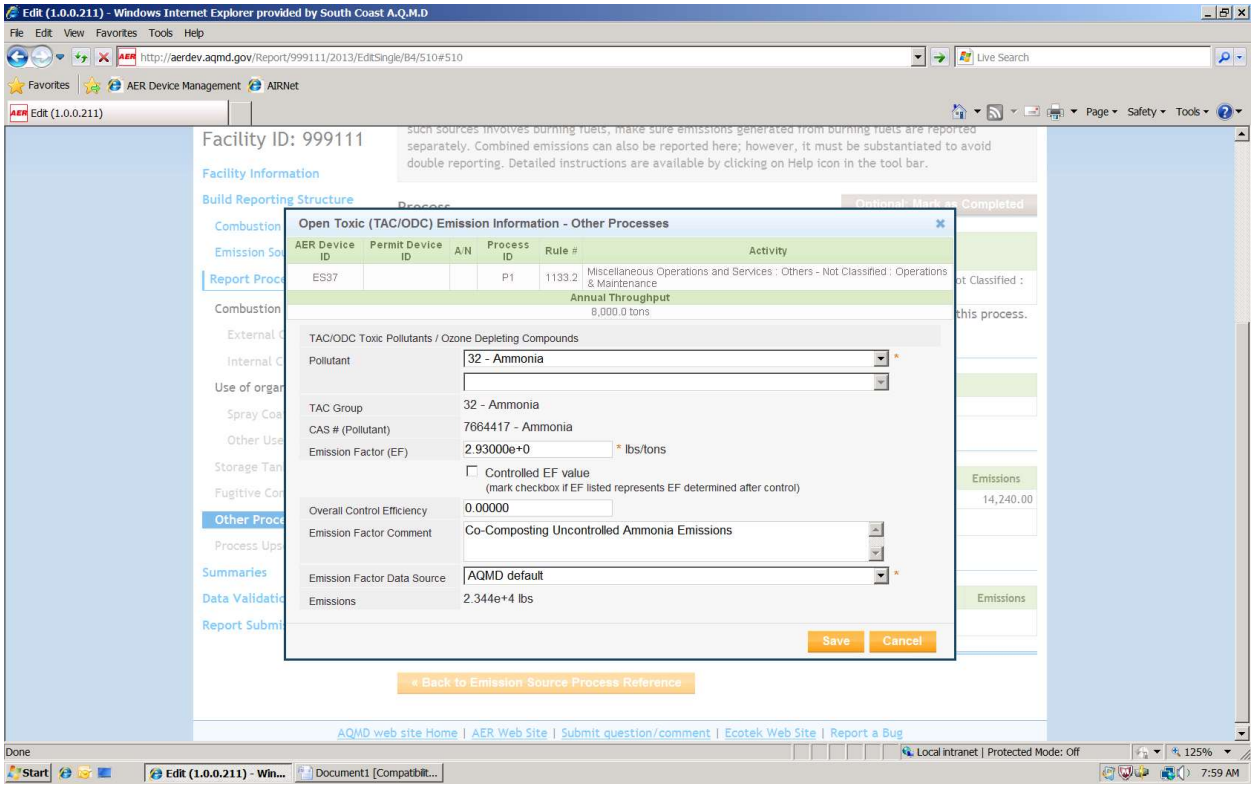
Operation 1: Screenshot #4: Input Throughput



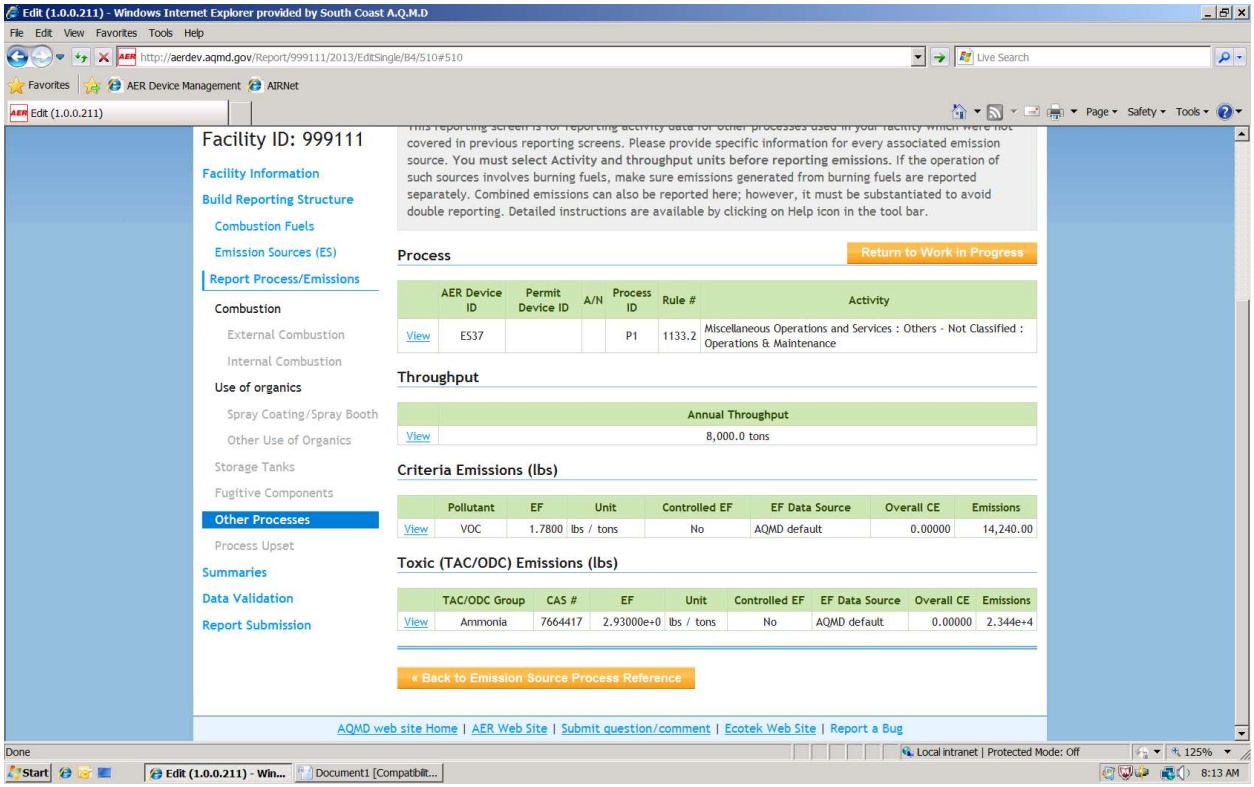
Operation 1: Screenshot #5: Enter VOC Information



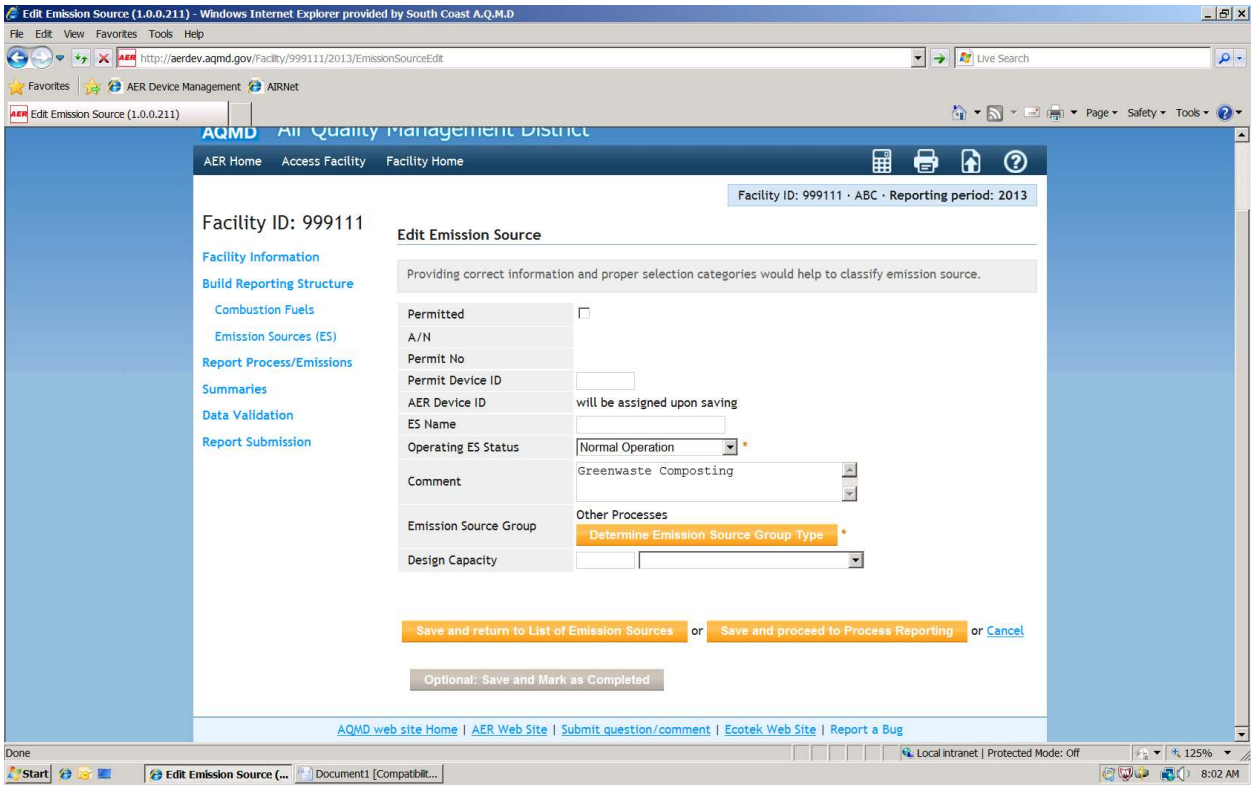
Operation1: Screenshot #6: Enter Ammonia Information



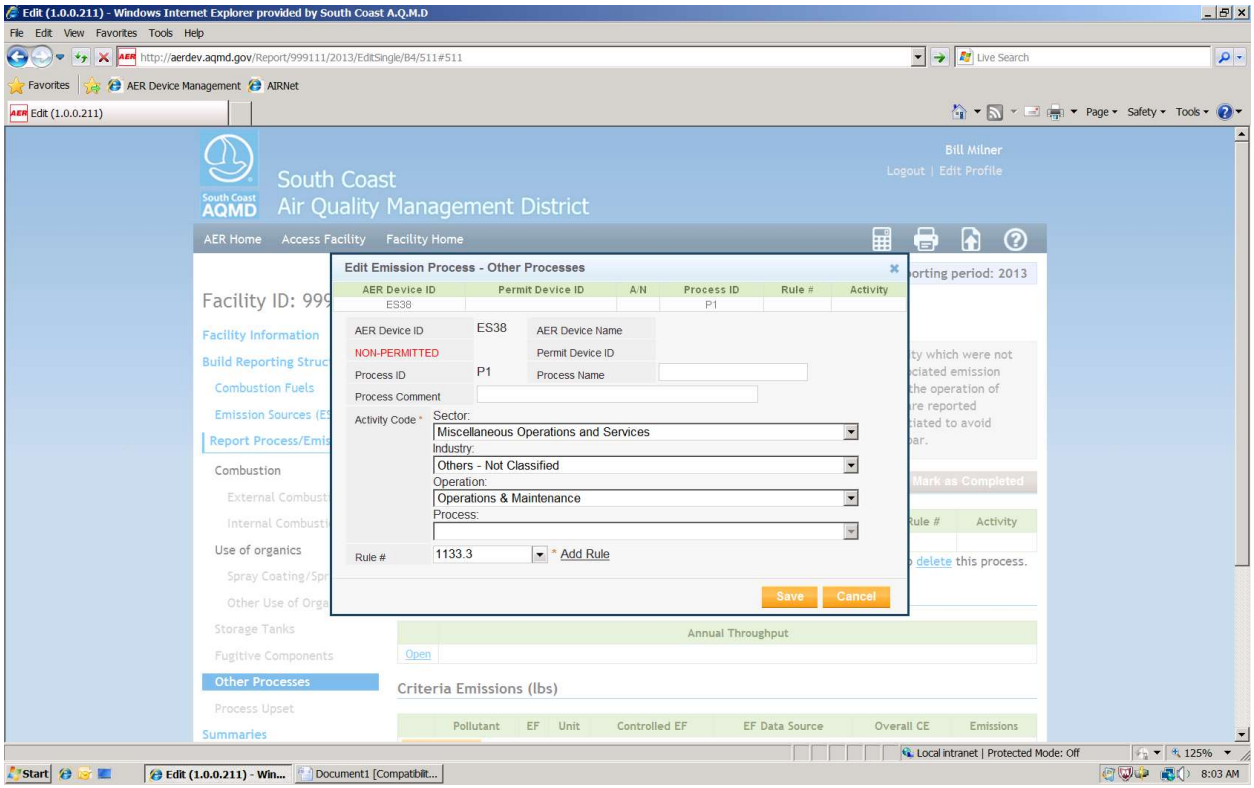
Operation1: Screenshot #7: Data Entry Complete



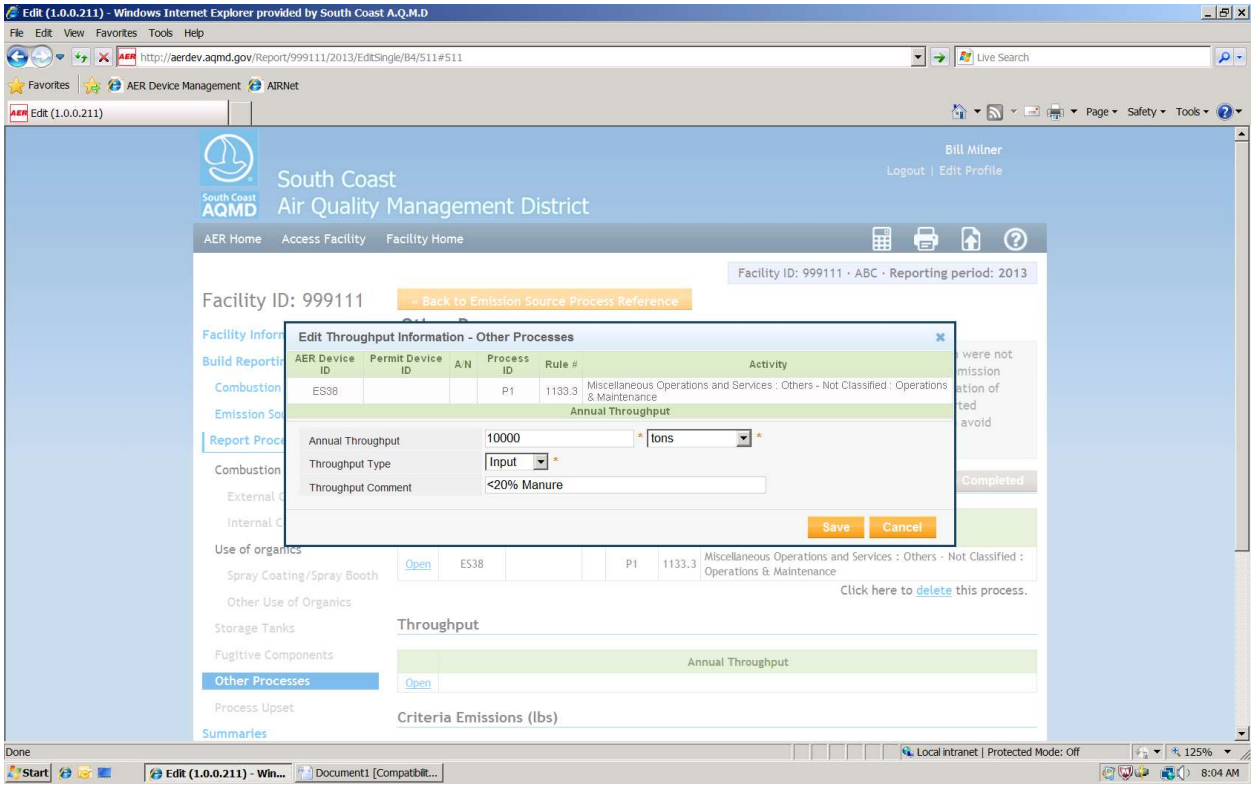
Operation 2: Screenshot #8: Add Emission Source for Composting with Best Management Practices



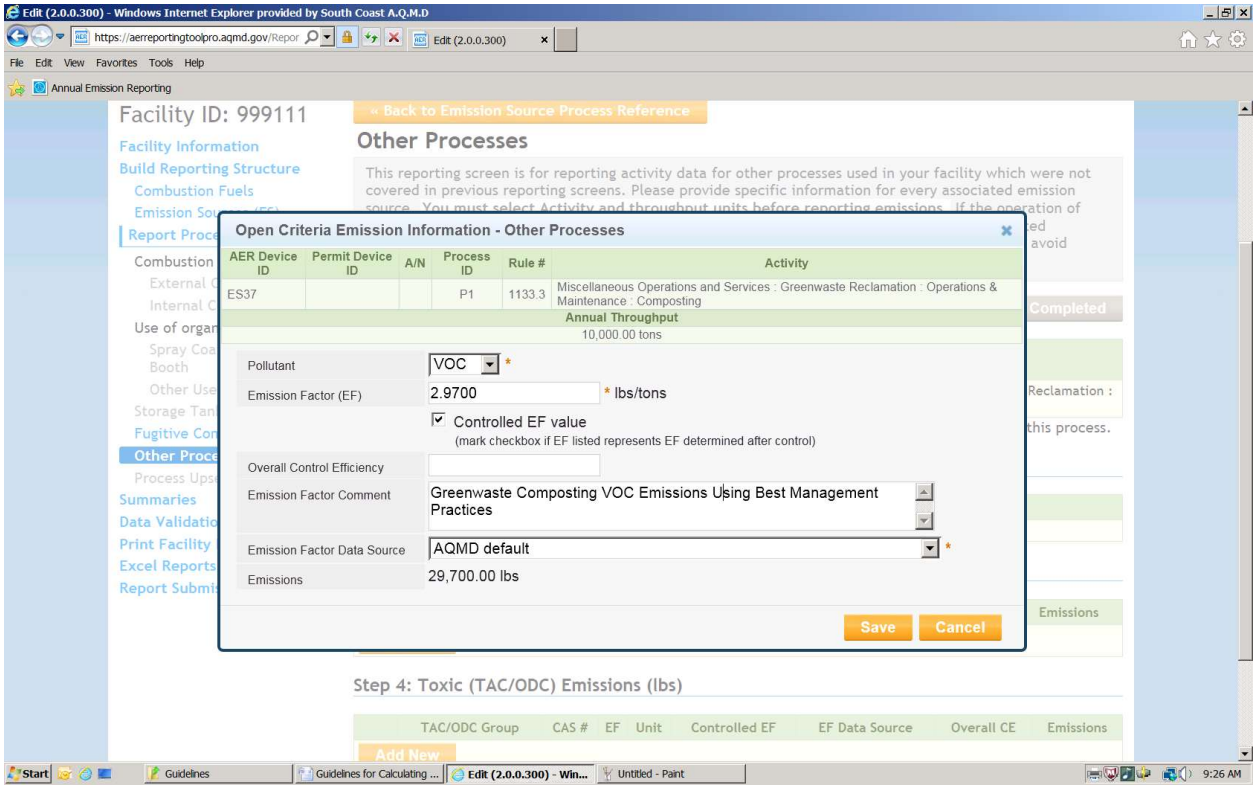
Operation 2: Screenshot #9: Assign Activity Code and Rule Number



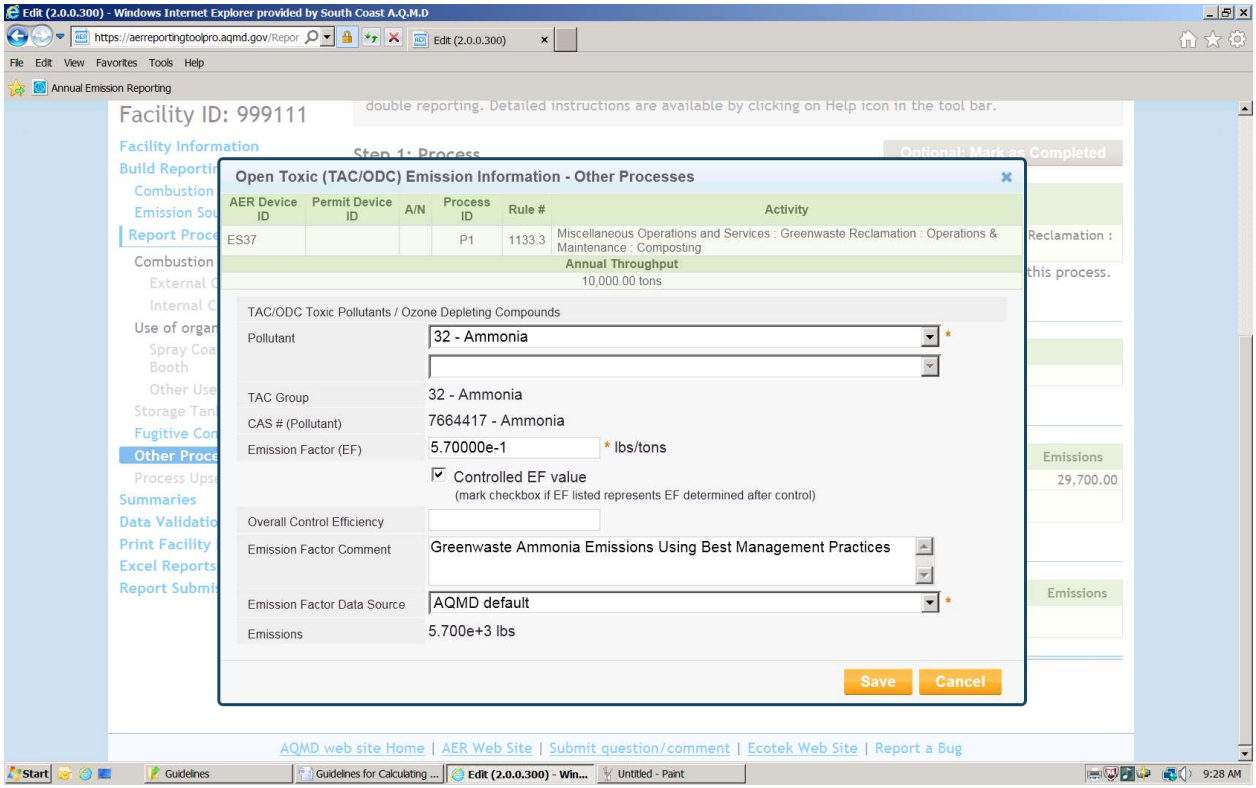
Operation 2: Screenshot #10: Input Throughput



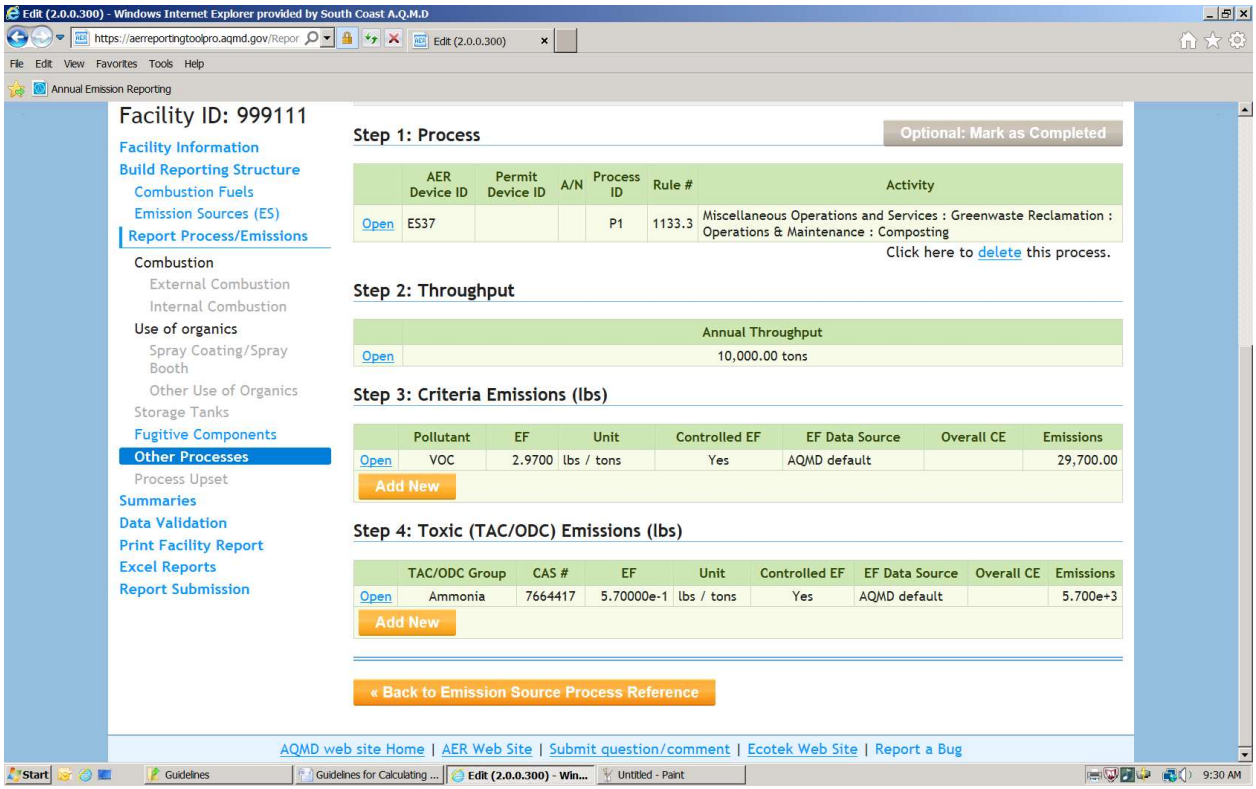
Operation 2: Screenshot #11: Input VOC Information



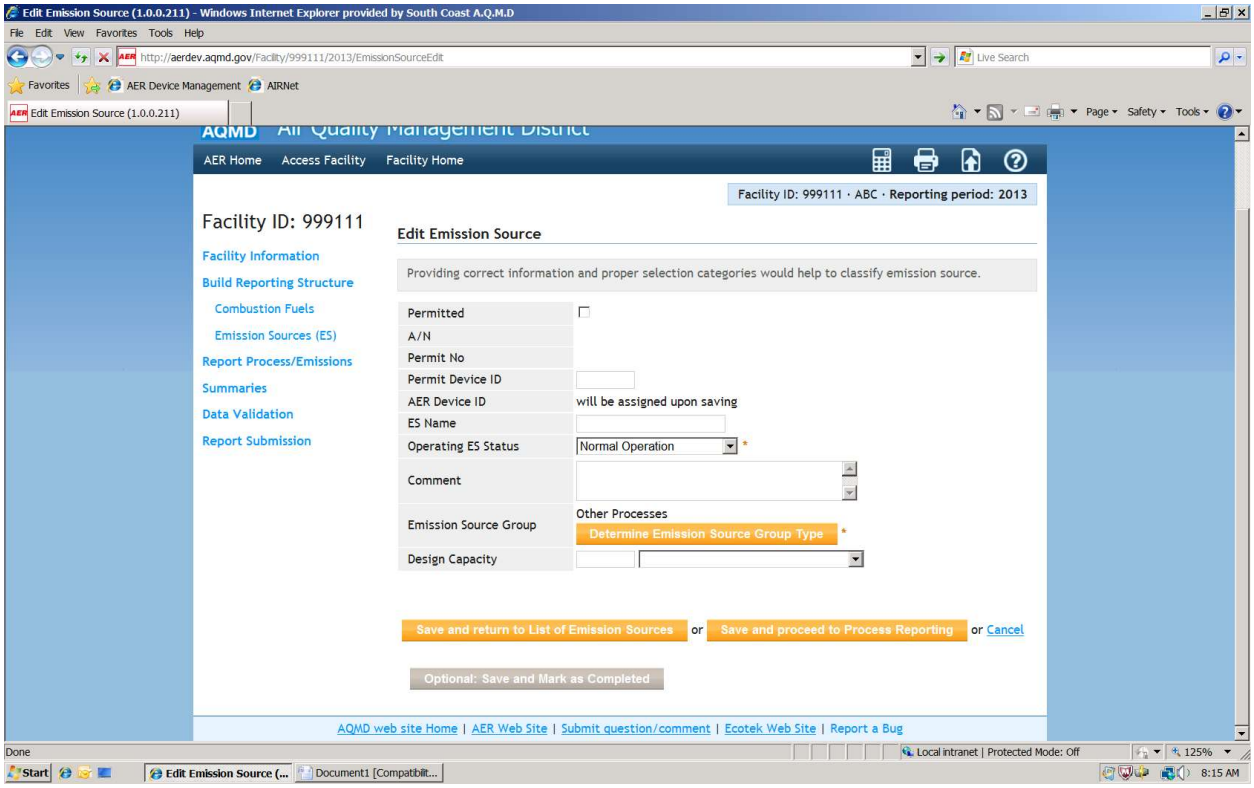
Operation 2: Screenshot #12: Input Ammonia Information



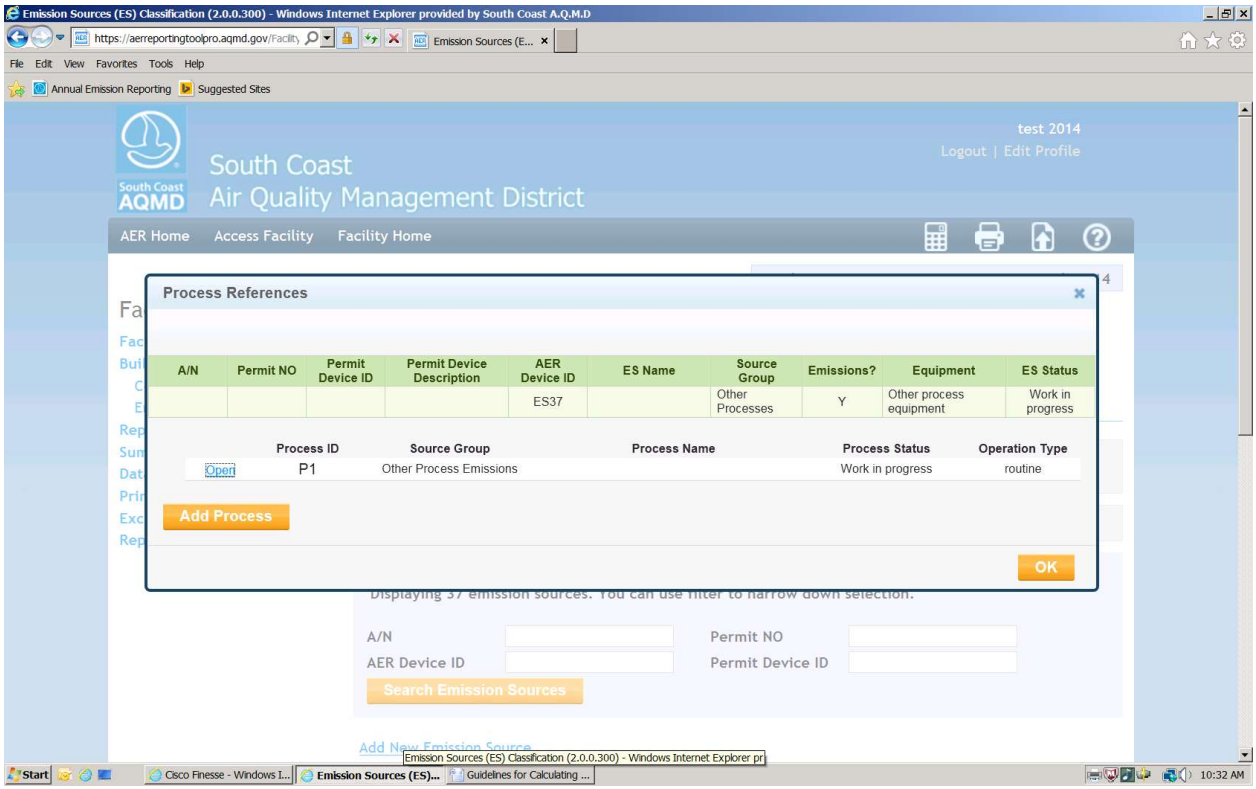
Operation 2: Screenshot #13: Data Entry Complete



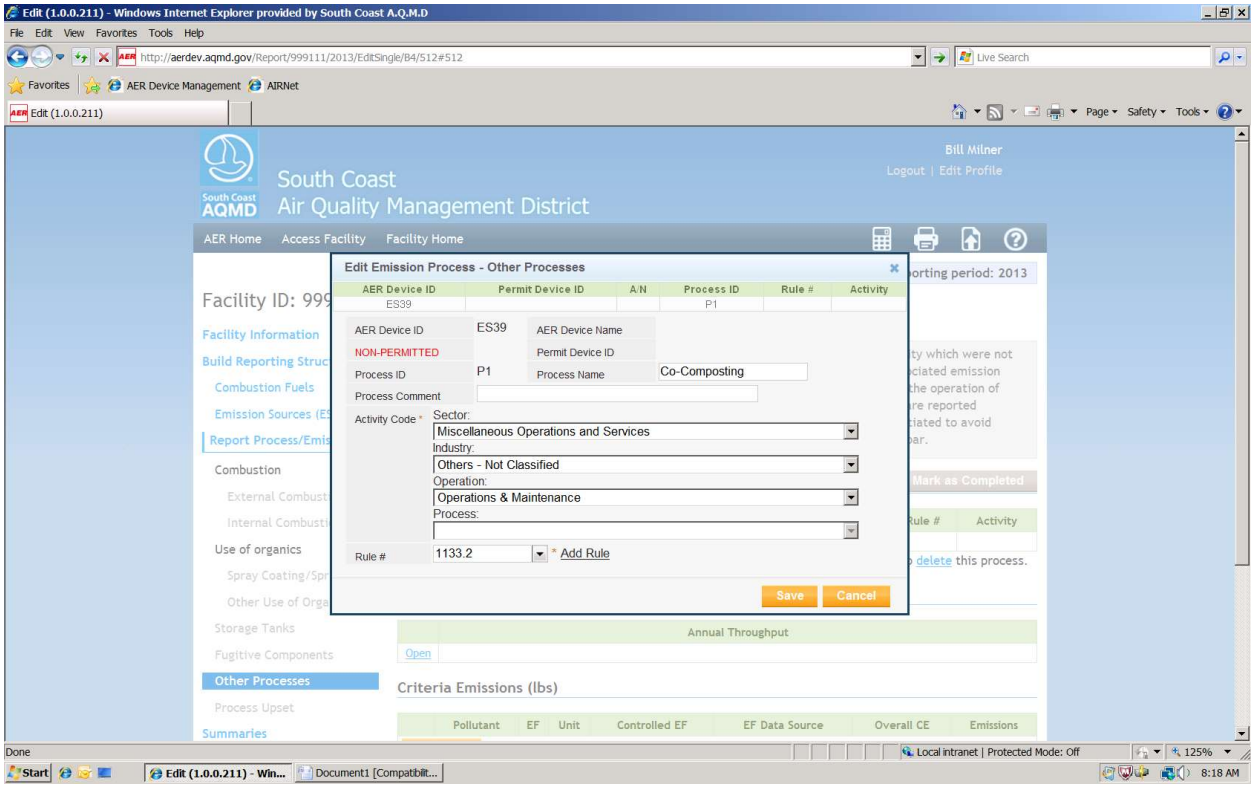
Operation 3: Screenshot#14: Add Emission Source for Co-Composting With Add-on Control



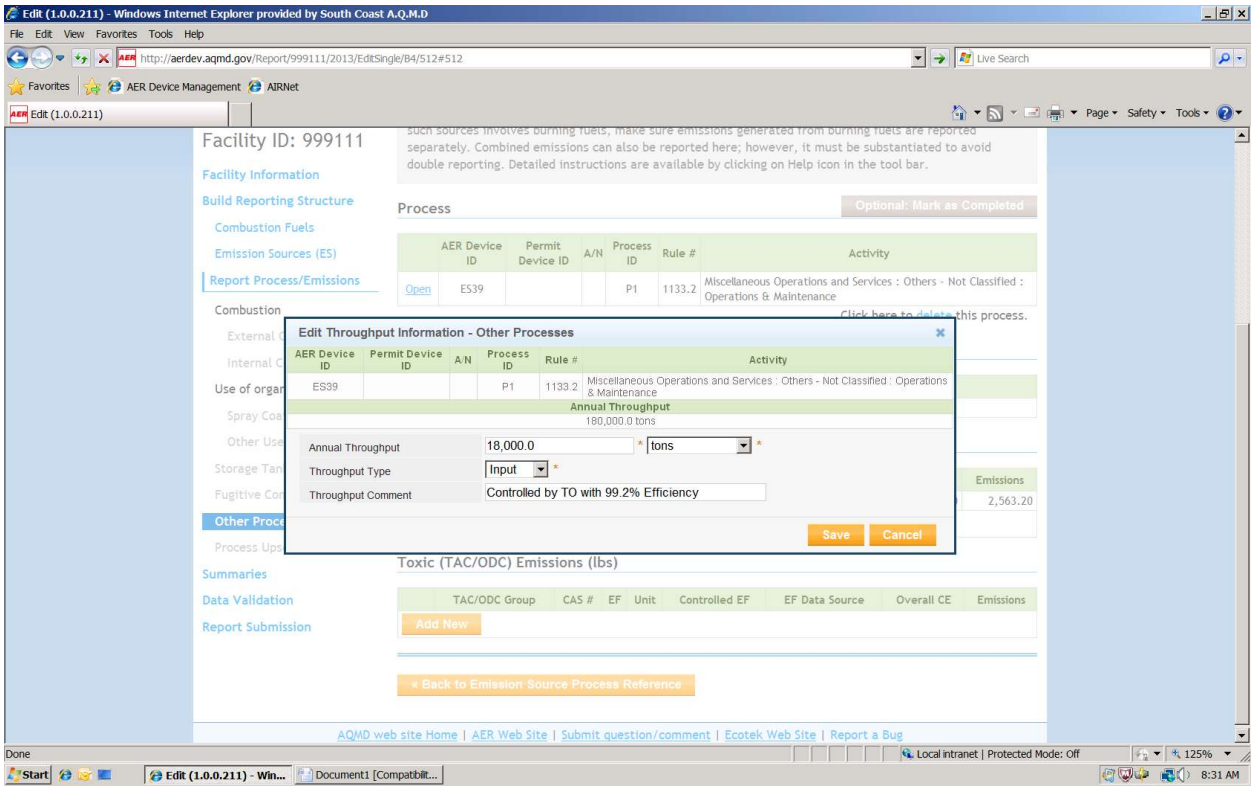
Operation 3: Screenshot #15: Select Process ID P1



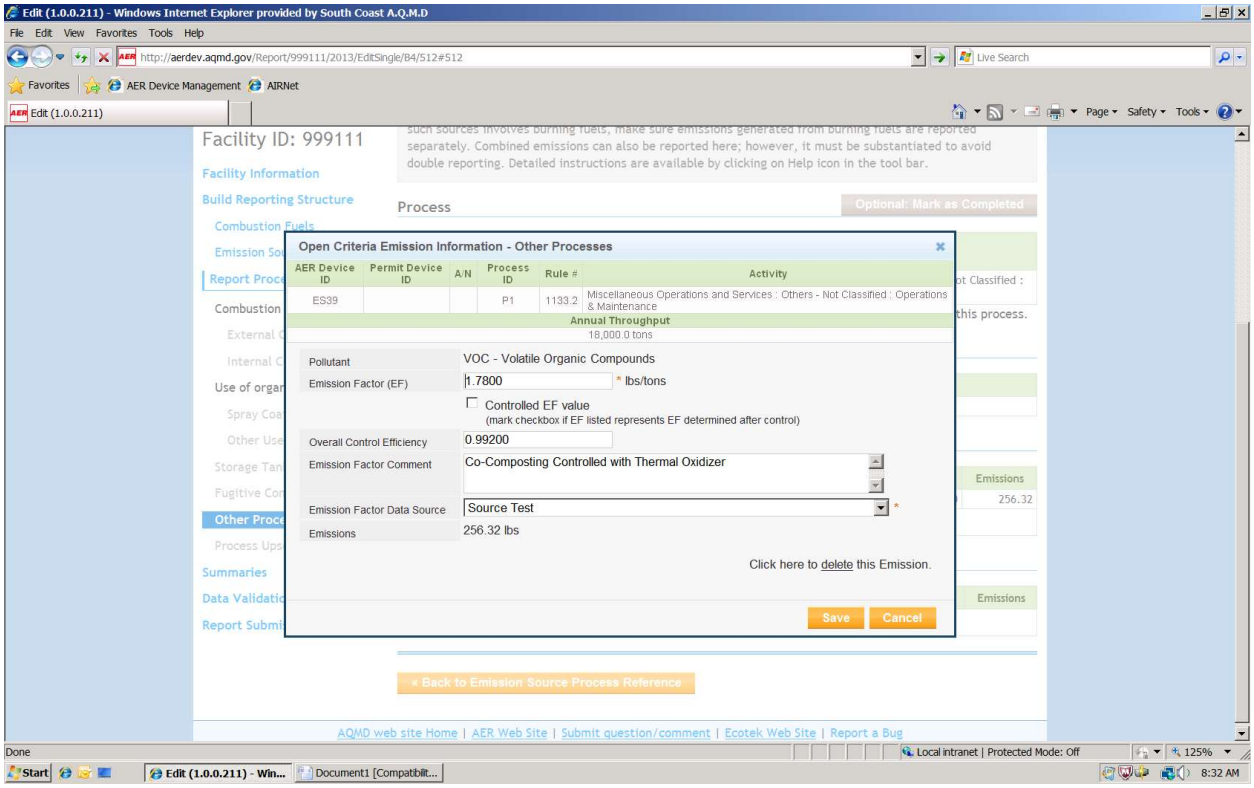
Operation 3: Screenshot #16: Assign Activity Code and Rule Number



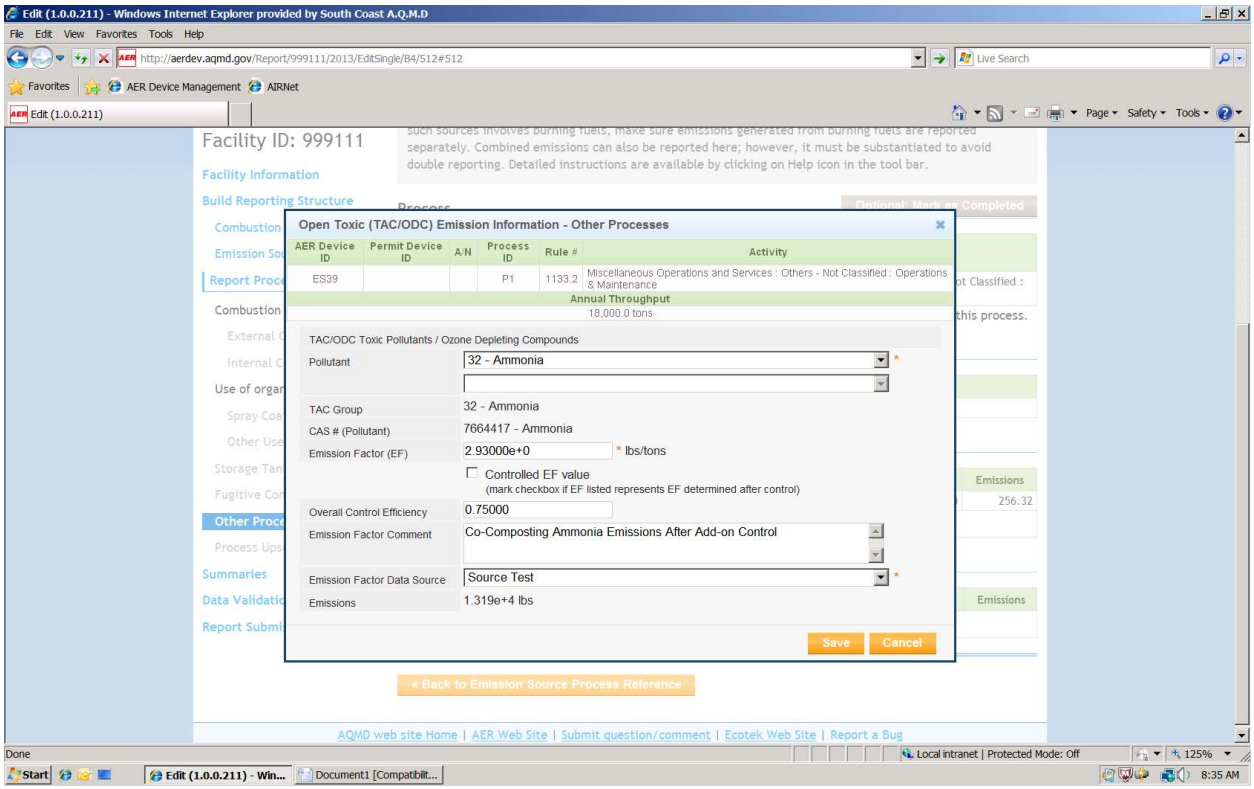
Operation 3: Screenshot #17: Input Throughput



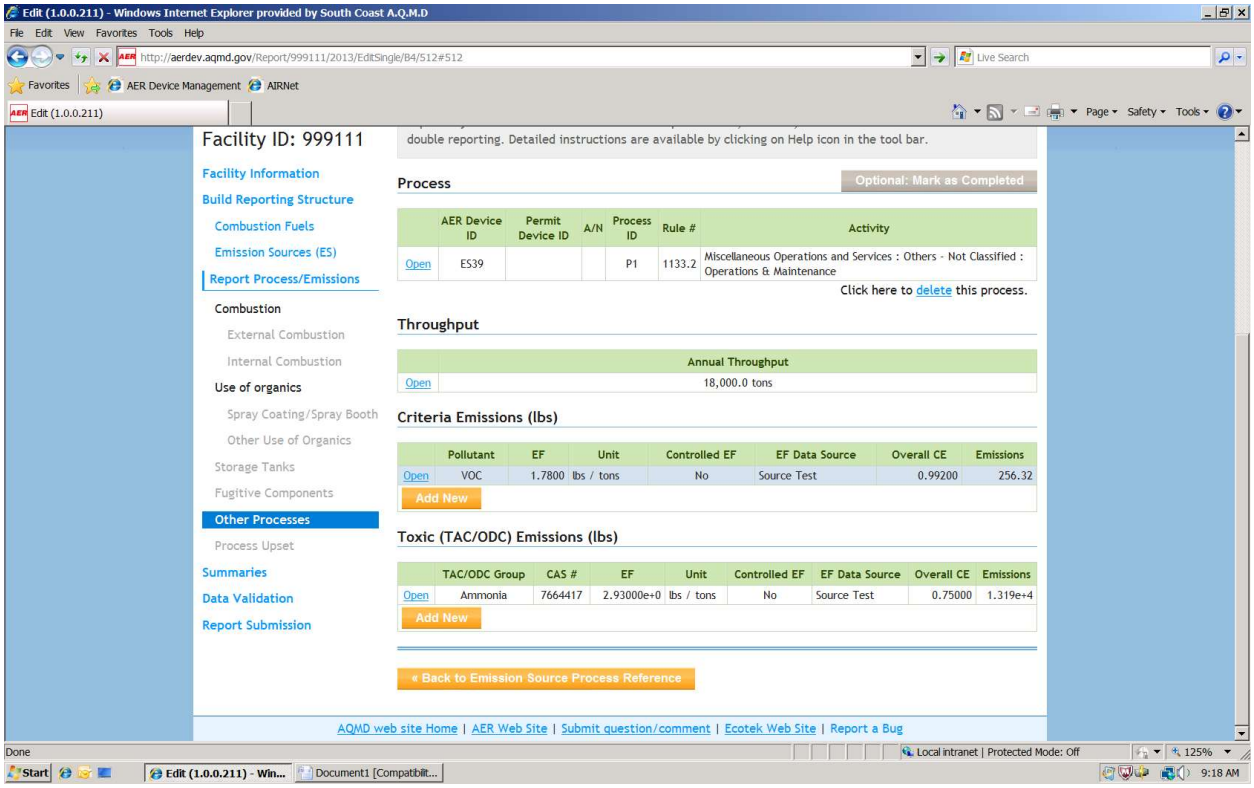
Operation 3: Screenshot #18: Input VOC Information



Operation 3: Screenshot #19: Input Ammonia Information



Operation 3: Screenshot #20: Data Entry Complete



Operations 1, 2 and 3: Screenshot #21: All Sources Are Added